

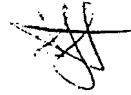
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MA 02203-2211

MEMORANDUM

DATE: September 15, 1992

SUBJ: Winthrop Five-Year Review

FROM: Andris Slesers, Student Trainee
ME & VT Superfund Section



THRU: Indria Balkissoon, RPM
ME & VT Superfund Section



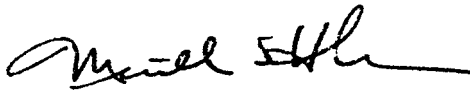
Mary Jane O'Donnell, Chief
ME & VT Superfund Section



David Webster, Chief
ME & VT Waste Management Branch



TO: Merrill S. Hohman, Director
Waste Management Division



Attached is the Winthrop Superfund Site Five-Year Review for your concurrence.

FIVE-YEAR REVIEW REPORT

WINTHROP
HAZARDOUS WASTE SITE

WINTHROP, MAINE

Prepared by:

U.S. Environmental Protection Agency

Region I

Boston, Massachusetts


Merrill S. Hohman, Director
Waste Management Division

089'92

Date

I. INTRODUCTION

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by Section 121(c), and Section 300.430(f) (4) (ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), a statutory Five-Year Review is required for remedial actions selected on or after October 17, 1986. The review must be completed within five years of the initiation of the remedial action, and every five years thereafter, for sites which will not allow for unlimited use and unrestricted exposure after attainment of the performance standards stated in the Enforcement Decision Document (EDD).

The EDD for the Winthrop Site took the place of the Record of Decision (ROD). The EDD discussed all viable Remedial Action options and provided the rationale for the selection of the appropriate remedy, with respect to protectiveness and cost effectiveness. This Remedial Action was then written into the Consent Decree.

EPA has developed a three tier approach to the Five-Year Review process. A Level III review would require the most in-depth review for sites where there is the greatest likelihood that the remedial actions implemented for the site are no longer protective. A level II review is expected to be a less intensive review, followed by Level I for sites where it is least likely the remedial actions are no longer protective. A Level I Five-Year Review is required at the Winthrop Landfill site in Kennebec County, Maine to confirm that the remedial actions and associated performance standards as presented in the Consent Decree of March 23, 1986 adequately protect human health and the environment(i.e., the remedial action is operating and functioning as designed, institutional controls are in place and are protective).

Although the Consent Decree is dated pre-October 17, 1986, Region 1 has made it policy to implement the first Five- Year Review five years after of the award of contract for the remedial action. The Winthrop Landfill Site contract was awarded to E. C. Jordan in 1987. This review shall be completed no less often than every five years after the initiation of the remedial action to assure that human health and the environment are being protected by the remedial action chosen.

The purpose of this Five-Year Review is to confirm that the remedies spelled out in the Consent Decree remain effective at protecting human health and the environment. In the case of the Winthrop Landfill Site the review will determine if protectiveness is being assured through exposure protection and institutional controls.

The completion of this report will be announced publicly. Copies of the report will be sent to the Site repositories for public use. The repositories consist of the Winthrop Town Hall, the Winthrop Public Library, and the Cobbossee Watershed District Office.

II. BACKGROUND

The Winthrop Landfill Site consists of two contiguous parcels located along the western shore of Annabessacook Lake in the Town of Winthrop, Maine. An 11 acre parcel is currently owned by the Town of Winthrop, and was owned and operated by the Town during the period in which the Landfill received municipal and industrial wastes, including hazardous substances. A large portion of the other parcel was bought and operated by current owners Everett Savage and Glenda H. Savage.

The site was initially used in the 1920' s as a sand and gravel pit. Waste disposal operations are believed to have started in the 1930s for solid waste disposal. Open-burning dump operations continued into 1972, when routine burning of wastes was banned in favor of sanitary landfill practices. Waste disposal stopped in 1982 except for disposal of brush, tree stumps, and construction debris by the Town of Winthrop in the east central portion of the Landfill. Storage of white goods and other materials for recycling, and operation of a transfer station for off-site disposal, also continued at the Site until late spring of 1987 when final Landfill Cap construction activities began.

The Site received hazardous substances between the early 1950's and mid 1970's. It is estimated that more than 3 million gallons of chemical wastes, mostly complex organic compounds including resins, plasticizers, solvents, and other process chemicals were disposed of at the Site. Spent liquids and pigmented sludge, known constituents of industrial waste, were dumped and burned primarily in Area B (see Attachment 1). Some drummed wastes, containing liquids and/or sludge, were dumped and/or buried on-site primarily in Areas A and G (see attachment 1). The current condition of the buried drums is unknown and represents a potential future source of waste constituents that may reach groundwater leaving the Site.

Contamination at the Winthrop Landfill was first noted in the southern portion of the Landfill in 1979 when a buried drum was uncovered. It was immediately covered over again and the incident was reported to the Maine Department of Environmental Protection (MEDEP). At about the same time, residents southeast of the Landfill began to detect chemical odors in private drinking water wells screened above bedrock. The odors were reported to be especially noticeable following heavy rainfalls.

Based on these observations, MEDEP conducted a preliminary investigation, including a Site inspection, interviews, and sample collection. Concern over the Landfill was aroused in 1980 when MEDEP detected volatile organic chemicals in a residential well south of the Landfill.

The Winthrop Landfill Site was proposed for the National Priorities List (NPL) in October, 1981. The Hazard Ranking Score (HRS) was completed on September 8, 1983, as stated in the Federal Register of that date, part VII, Final and Proposed Amendments to National Oil and Hazardous Substances Contingency Plan; National Priorities List. The Landfill received a score of 35.62.

Based on the listing, USEPA authorized a Remedial Investigation and Feasibility Study (RI/FS) of the Site by CH2M Hill. Initial field activities began in December, 1981. The purpose of this RI was to characterize the Site media and to determine vertical and areal distribution of chemicals in Site media. Investigations conducted included topographic mapping, installation and sampling of monitoring wells, a seismic survey, and the sampling of private wells and of a groundwater discharge seep exposed in October and November, 1984, when the lake level was dropped unusually low to conduct repairs on the outlet dam structure. The FS identified and developed a set of possible responses (alternative remedial actions) to the release of hazardous substances at the Site. The objective of the report was to assist EPA in selecting "the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment" ((NCP, 300.68 (j))). The RI/FS grouped together different Remedial Actions and came up with 20 individual groupings that could be implemented at the Winthrop Site (see Attachment 2).

An independent Landfill Study during October and November, 1985, by the Settling Party, was conducted to determine groundwater quality directly under the Landfill and to locate buried drums. At that time the 100-series wells were completed and fewer than 10 deteriorated drums were encountered, most appearing to be burn barrels. A few contained remnants of sludges but no solvents or sludge deposits were encountered in the excavations. An observation from this Study was that no waste was located below the water table. Ongoing monitoring continues to detect Landfill Landfill groundwater downgradient indicates that the Landfill waste continues to be a source.

The Feasibility Study, completed in 1985, led to the EDD. The EDD, dated November, 1985, assessed all of the possible Remedial Actions that could be implemented at the Site and narrowed them down to a specific few that would best protect public health, welfare, and the environment. By using grouping 16 as a backbone (see attachment 2), EPA added and deleted several Remedial Action alternatives. The EDD came to a conclusion that the Remedial Action Work Plan (RAP) will include continued monitoring, land use restrictions, an alternate water supply, regrading of the landfill, capping the entire landfill area, an ACL demonstration, groundwater extraction and treatment, and other additional studies. These recommendations of the EDD were incorporated into the Consent Decree.

The Consent Decree serves the purpose of legally binding all of the involved parties to its terms. As stated in the CD, the "Settling Parties" are the defendants who have signed the document. They include the Inmont Corporation, the Town of Winthrop, Maine, and Everett Savage and Glenda H. Savage. The Settling Parties have agreed to enter into the Consent Decree with the United States and the State of Maine. Hereafter, "Settling Party" will refer to only Inmont Corporation and its contractors. Inmont Corporation was bought by United Technologies Corporation (UTC) in 1978, which in turn sold Inmont to BASF in 1985, but was bound in that sale to retain all environmental matters. UTC contracted E. C. Jordan, Inc. which was bought in May of 1987 by Combustion Engineering, and then subsequently bought by the present contractor Asea, Brown, Boveri Environmental Services (ABB-ES).

The Consent Decree required the Settling Parties to implement a Remedial Action Work Plan which included the listed Remedial Actions. Items 1, 2, 3, 4, 6, and 7 are complete, items 9 and 10 depend on the outcome of item 8, and item 5 is an ongoing program:

1. Extension of Alternate Water Supply
2. Fence and Landfill Use Control
3. Groundwater Use Control in Areas 1, 2 and 3
4. Excavation Control in the Landfill and Areas 1, 2 and 3
5. Monitoring Program
6. Landfill Cap
7. Engineering Studies
8. Establishment of Alternate Concentration Limits (ACLs)
9. Installation and Operation of a Groundwater Interceptor System
10. Installation and Operation of a Groundwater Treatment System

While the ACL Demonstration is being developed the RAP has established Interim Performance Standards (IPS) to protect public health and the environment. For the protection of public health, the IPS was based on the recreational use of Annabessacook Lake, including fish ingestion. The IPS was developed based on the

assumption that all Landfill constituents were present in the lake water even though most were shown to be not detectable by analytical means. As a result, the IPS considered all constituents to be present concurrently at their analytical detection limits and also established the allowable incremental cancer risk for each constituent to be 1 in 100,000 (10⁻⁵). This is within the USEPA recommended cancer risk range of 1 in 10,000 (10⁻⁴) to 1 in 100,000 (10⁻⁶). In the time that the IPS has been in effect, there have been exceedances in the monitoring events, but they were not confirmed in subsequent events. Thus, the IPS was not breached. If the IPS is ever breached before the ACLs are set, then the CD dictates that the groundwater Extraction and Treatment System must be implemented.

The selected remedy for this Site is at present an impermeable clay Cap. The goal of the Cap is to inhibit groundwater from entering the Landfill volume and carrying out Landfill contaminants. The next objective as defined by the Consent Decree is the completion of the ACL Demonstration document. This has been submitted to EPA and MEDEP and is being reviewed. If it is accepted then it will replace the IPS with new protective levels. If the ACL Document is rejected then the protective levels will be set at background levels from already specified wells. The CD describes the following procedure for establishing noncompliance with ACLs:

- a). If the concentration of a contaminant at a compliance point is found to exceed the ACL, an additional four replicate samples will be taken from the compliance point and analyzed for that contaminant within 7 days.
- b). A statistical test shall be made to determine if the data from the replicate sampling event referred to in item a) are normally distributed.
- c). A t-test shall be made to determine whether the mean value determined exceeds the ACL at the one percent level of confidence.
- d). If a signature difference is determined in accordance with b) and c) above, a second round of replicates shall be collected promptly to confirm the significant difference, as described in b) and c) .

If it is determined that there is an exceedance of the ACL, then the groundwater Extraction and Treatment Systems will be implemented. Otherwise the Landfill Cap will be the final remedial action, besides monitoring, done at the Winthrop Site.

III. REMEDIAL ACTIONS

The scope of this Five-Year Review requires that all present and past remedial actions be reviewed. This includes all of the actions that fall under Operable Unit 1. Operable Unit 1 consists of the Landfill Cap, Operable Unit 2 will consist of the ACL Demonstration, due to be submitted on September 24, 1992, and Operable Unit 3 will consist of the Groundwater Extraction and Treatment Systems. The 90% design of the Extraction and Treatment Systems is expected in the First Quarter of 1993. Operable Units 2 and 3 will be reviewed in future Five- Year Reviews because they have not yet been received or implemented.

1. Extension of alternate water supply - This was completed on October 20, 1987 when the Settling Party submitted a letter to USEPA and MEDEP, along with record drawings, stating the project s completion. The five tasks necessary for completion of the extended water supply included:

- a. Identifying unconnected residences
- b. Requesting access and permits from the town of Winthrop
- c. Preparing appropriate engineering plans
- d. Installing connections
- e. Documenting installation

During the summer of 1984, the Settling Party extended the water system to residences along the affected shore areas of Annabessacook Lake, and disconnected the houses from the their local wells. The only two post- CD connections needed to be made, to satisfy this portion of remedial action, were to summer cottages. They were connected to the Town water supply by July 17, 1987. There is no further EPA action required with this project. EPA will submit a letter of completion in compliance with paragraph 15 of the Consent Decree after the Five-Year Review is completed.

2. Fence and Landfill use control - The building of the fence is part of the Landfill Cap construction contract. The purpose for the fence is to keep trespassers away from the Cap. The action includes the fencing in of three areas: The Main Landfill Cap, the capped area north of North Camp Road and Sphagnum Bog. The Landfill Cap construction contract calls for a chain link fence placed five feet from the toe of the Cap, and a woven- wire fence enclosing Sphagnum Bog. A temporary fence was built around the Landfill by January 9, 1987. In May of 1987 easement talks began and construction of the

permanent fence around Sphagnum Bog began on June 22, 1987.

Portions of the temporary Landfill fence were replaced by plastic fencing material in areas that required daily or frequent entry. The construction of the permanent chain link Landfill fence began in September of 1987 and was finished on October 23, 1987. Due to vandalism to the woven-wire fence surrounding Sphagnum Bog, it was replaced by a chain link fence in 1990. The only true incomplete part of this remedial action is that the Town of Winthrop has not yet secured construction and maintenance easements. The Settling Party believes that the Town should fulfill all of the easement requirements of the Consent Decree. Although the easement issue has not been settled, the access issues have been worked out. EPA sent a Remedial Action Completion letter to the Settling Party, dated June 23, 1992, that approved the fence in conjunction with the Cap.

Landfill use control as described in the Consent Decree, mandated that the Town and the Savages cease operation of the transfer station and solid waste depository, that the Town remove all of the white goods and all piles of tree stumps, wood, brush, and other similar debris from the areas of the current landfill surface which are to be capped and fenced, and that the Savages remove all vehicles and other debris from the areas of the current landfill surface which are to be capped and fenced. These actions were completed and EPA is presently investigating the status of the construction and maintenance easements.

3. Groundwater Use Control in Areas 1, 2, and 3 - This Attachment to the Remedial Action Work Plan of the Consent Decree was prepared by the Town of Winthrop. A part of the Attachment is the Town of Winthrop's Ground Water Protection Ordinance, passed by the Winthrop Council on October 7, 1985 which included the Landfill Site. The purpose of the Ordinance, is to protect the groundwater resources of the Town from adverse development of land-use practices that might reduce the quality of water. EPA's concern to implement this Ordinance at the Landfill Site was to insure that the contaminated groundwater was not used in any ill- advised manner, such as drinking water. Under the Ordinance it is illegal to:

- a. Dispose of solid wastes, other than brush and stumps.
- b. Dispose of liquid or leachable wastes except for residential sub- surface waste disposal systems.
- c. Remove groundwater by any means, including residential wells, except in cases where a public waterline is not located within 800 feet of the proposed site.
- d. Mine or excavate land except that which is solely for residential purposes.

Although part (c), above, refers to removal of groundwater, the Attachment to the Remedial Action Work Plan of the Consent Decree specifically spells out that this does not refer to any removals that are warranted as Remedial Actions. Hence, groundwater and surface water sampling, and the building of the Cap is allowed.

In the late 1980's, a lot adjacent to the Landfill was subdivided and sold. The Town of Winthrop contacted EPA before building permits were issued, in order to assure themselves that it is safe to dig drinking water wells in the vicinity of the Landfill. EPA was concerned that new drinking water wells could change the flowpaths of plumes, and possibly expand the area of contaminants. EPA recommended that the groundwater Ordinance be expanded to include the area in question. The revision was passed by the Winthrop Council on April 1, 1991, and the Ordinance was extended North of the Landfill Area. The new residences were brought on-line with the Town water supply.

4. Excavation Control in the Landfill and in Areas 1, 2, and 3 - The Ordinance that governs Excavation Control is the same as in (3), above, for Groundwater Use Control. For both parts (3) and (4) EPA will submit a letter of completion to the Town of Winthrop in compliance with the paragraph 15 of the Consent Decree after the Five- Year Review is completed.

5. Landfill Cap - As noted in the Consent Decree, the Cap must provide long term minimization of the migration of liquids through the surface of the closed Landfill, and provide for appropriate gas control necessary to mitigate any adverse effects on human health and the environment associated with the generation, migration, and uncontrolled release of Landfill gases. The Cap was designed in accordance with 40 C. F. R. Part 264.310(a), which states the following: At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to:

1. Provide long- term minimization of migration of liquids through the closed landfill;
2. Function with minimum maintenance;
3. Promote drainage and minimize erosion or abrasion of the cover;
4. Accommodate settling and subsidence so that the cover's integrity is maintained; and

5. Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

Construction and survey activities for the Cap started in May, 1987. The design of the Cap warranted the regrading of the Landfill surface by placing common borrow to achieve specified minimum and maximum grades, to enhance runoff, avoid erosion of the cover, and accommodate subsidence. There was no excavation on the Site. The Cap, consisting of a minimum of 18 to 24 inches of low-permeable soil overlain with an 18-inch sand drainage layer, in turn covered with a 12-inch vegetative soil layer, was placed on the existing surface. The resulting Cap is 4 to 4.5 feet in thickness, varying to greater depth where more borrow was necessary to fill the underlying Landfill to grade.

On August 18 and 25, 1987, the slope of the constructed Cap of the eastern side of the Landfill moved. The movement resulted in a scarp along the limit of waste and raising of land surface along the fence line. Construction was halted in this area pending investigation and selection of a corrective program to reconstruct the slope. Further field studies confirmed movement in both the northern and southern slopes. Reseeding was implemented to control erosion and on October 9, 1989 slope reconstruction started. Reconstruction consisted of excavating 38 inches of existing soil and replacing it with an equivalent hydraulic performance cover system that was approved by EPA and MEDEP. Construction was completed on October 27, 1989. Seeding was completed on November 1, 1989.

Problems encountered were those of Cap movement, the forming of erosional rills, ponding at the toe of the southern slope, runoff from the southern end of the Cap damaging South Camp Road, occasional vandalism to the Sphagnum Bog woven-wire fence, and stealing of Hazard Warning signs. The Cap is now fully functional, and will be mowed bi-annually for the thirty year period to which the Settling Party is bound in the CD. In June of 1992, EPA sent a letter to the Settling Party stating that the Cap has been accepted as a completed remedial action as specified in the Consent Decree.

6. Monitoring program - The scope of the quarterly monitoring program is specified in Appendix A, Paragraph II-5, and Attachments III and VIII of the Consent Decree. Monitoring will help to assess the effectiveness of remedial action undertaken at the Site. Data collected from the monitoring program will also be useful in assessing the need for further remedial action at the Site. The program provides quarterly sampling for 9 monitoring wells, 14 surface water and 14 sediment sampling locations. Quarterly analyses are conducted for all chemicals listed in Table 1 of the RAP (see Attachment 3), and analyses for all RAP Table II compounds (see Attachment 4) is done annually. The annual sampling and analysis program is conducted to confirm that parameters of the quarterly program are sufficient to monitor effectiveness of the RAP and provide early indication of unexpected changes in water quality. Water quality is compared to the Interim Performance Standard (IPS) (see Attachment 5). If the IPS is deemed to be in exceedance, the extraction and treatment systems will be implemented.

Since the beginning of the Monitoring Program in November, 1985, the improvements made have been of great benefit to both the Settling Party and EPA. Many wells and sampling points, including private wells, have been added to the program to obtain the best possible idea of the extent to which the plumes are migrating. Presently the Settling Party is sampling in the range of 109 different locations during each quarterly sampling event. Until the late 1980s, the sampling rounds turned out results that were plagued with erroneous results due to contamination from non-landfill sources. The Settling Party has taken EPA's advice on many issues, and the sampling data and reports have been "cleaned up" considerably. Lab contamination is close to zero, the field procedures have become stricter with regards to decontamination, and the written reports are expressed clearer, with more interpretations from the non-sampling data collected (such as water levels). The Monitoring Program has been consistent with the provisions provided in the CD. The Quality Assurance Project Plan (QAPP) has been complied with and the Program has been expanded upon EPA's requests.

Under the Consent Decree, Remedial Action Work Plan (II) (5) (c), EPA must review the adequacy of this monitoring program. At this time the Town of Winthrop of the Settling Party may propose to decrease the frequency of sampling rounds, number of sampling locations, and/ or duration of the monitoring program, or eliminate specific compounds from Table 1 and/ or 2. Neither the Town nor Settling Party have requested a change in the monitoring program.

7. Engineering studies

Seismic and Topographic Surveys - There is a bedrock trough running northeasterly beneath and beyond the Site. Since chemicals have been found in the groundwater flowing in the trough, it was necessary to define the exact orientation and configuration of the trough through the seismic survey. The topographic survey provided up-to-date topography on the Landfill surface. This helped indicate the extent to which regrading and covering was necessary to build the Landfill Cap. The survey was

conducted using aerial photography and ground control survey techniques. Both the seismic and topographic surveys have been completed in accordance with the work plan provided as Attachment IV to the RAP. The surveys were approved by MEDEP and EPA, subject to submittal of raw seismic data, December 15, 1986, and the cross sections on the 100- foot stations were submitted on January 27, 1987, with the commitment to provide updated topographic maps as additional information is obtained.

Sediment Sampling and Analysis - This program is described in Attachment V of the RAP. The purpose of this study was to locate the extent and concentrations where groundwater is discharging into the Annabessacook Lake and Hoyt Brook. The study was done from January to April, 1986 with the final report submitted in November of 1986. The sampling locations were altered from the specifications of the RAP, after review of the Seismic Study Results and the public's comments of a meeting in January, 1986. Results of the sediment study indicated that several organic chemicals, possibly related to the Landfill, were detected. The concentrations of these chemicals were found not to pose a threat to human health or the environment, based on water quality and the IPS provided in CD. No further analyses were done and EPA has not suggested additional actions to be taken.

Hydrogeologic Investigation - As stated in the Remedial Action Work Plan, the Hydrogeologic Investigation was to include the following:

- a. Methods to define the limits of the plume.
- b. Monitoring well location, design, and installation, including provisions for cluster wells.
- c. Groundwater flow models used and assumptions applied.
- d. Pump Test Parameters.

The Settling Party has used Geologic, hydrogeologic and hydrologic Investigations to determine the limits of the plumes. The **Geologic Investigation** included soil boring and monitoring well installation, a bedrock outcrop and photolineament study, and a terrain conductivity study. The 200 and 300-Series monitoring wells were installed in the Cap, the bog, and the surrounding area in an area approximately 1.5 miles in length, along Annabessacook Lake, by less than a mile in width from the shore.

The use of aerial photography and the study of outcrops, along with regional historical glacial and bedrock information, provided the Settling Party with a clear picture of the underlying structure. The terrain conductivity study was done during the week of October 15, 1988 and used an EM 34-3 Terrain Conductivity Meter. The results gave conductivities of the soil layers ranging in depth from 25 to 50 feet below ground surface.

The hydrogeologic investigation investigated groundwater seepage into Annabessacook Lake and Hoyt Brook, monitored groundwater levels for barometric effects, monitored groundwater and lake levels during annual lowering of the lake, estimated permeability of monitoring wells and rock boreholes along the northern and southern flowpaths, performed a 115 gpm aquifer pumping test and performed flow net analyses along groundwater discharge flowpaths north and south of the Landfill.

Eleven piezometers, twenty six lake wells and seven seepage meters were installed to record any seepage into the lake or brook. The barometric evaluation was conducted in two one-week monitoring periods in the beginning of 1989. The monitoring program came to only one very significant conclusion, that one of the monitoring wells is directly related to Hoyt Brook. This was observed during a one foot rise in brook level.

The Aquifer Pumping Test was initiated on September 12, 1989 with step tests, and subsequently on September 18 the constant drawdown test was started. It ended on the evening of the 19th. Aquifer parameters, extent of capture zone due to pumping, and chemical changes in extracted groundwater were evaluated, and graphic plots of drawdown over time were prepared for all monitored wells.

Interpretive flow nets were prepared to estimate the dimensions of the discharge zones and quantify the volume of groundwater discharge to Annabessacook Lake in the south and Hoyt Brook in the north. The flow nets delineate flow tubes (i.e., a conceptual region between adjacent flow lines). A profile flow net was developed for the south and a plan view and profile flow net for the north.

Since construction of the Winthrop Primary Treatment Facility in 1957 there have been many hydrologic studies ongoing in and around Annabessacook Lake. Based upon the terms of the Consent Decree the Hydrogeologic Investigation was started in May of 1986, with the submittal of the Work Plan. The final report was submitted to EPA in early April, 1992. The time discrepancy is due to the fact that the Settling Party did not submit an adequate work plan in 1986. They have worked with the EPA and MEDEP to improve this program. Since then, the Settling Party has been submitting partial work plans that cover only certain aspects of the remedial action to be done. This has worked better than formulating

a long agenda, which must be changed, due to the fact that new conclusions can be drawn from completed actions. EPA has sent the Settling Party a letter of Conditional Completion of the Hydrogeologic Investigation. The conditions require the addition of most recent data as well as revision of data unacceptable to EPA. Upon the completion of the conditions specified, and the submittal of the revised Final Report this letter will satisfy paragraph 15 of the Consent Decree.

Treatability Studies - This plan involved the treatment of all the water pumped out during the constant drawdown test of September 18, 1989. It was proposed that the water would be stored and treated by using ultraviolet (UV)/oxidation technologies. The bench scale testing proved this as a viable solution, but upon encountering the actual groundwater, the technology failed and a back-up plan was implemented. Granular activated carbon units were used to treat the water. On November 3, 1989 the treatment was complete and 250,000 gallons had been treated to comply with MEDEP MCLs (Maximum Contaminant Levels), and MEGs (Maximum Exposure Guidelines). The treated water was discharged nearby in a seepage pit.

Wetlands and Floodplain Mitigation - The goal of this plan was to identify actions planned during construction and after installation of the Cap to protect Sphagnum Bog and Cattail Marsh. The plan also includes an activity to assess the potential capacity of the wetlands to receive treated effluent from the groundwater treatment plant.

Because the Cap had to take up an area of Sphagnum Bog, approximately 20-by-680 feet square, the Settling Party was required to replace an equal amount of wetlands. The solution the Settling Party utilized was to plant wild rice along a portion of Annabessacook Lake, North of the Site. This remedy has been successful and the fourth year of implementation started with the seeding event taking place on May 8, 1992. This should terminate this particular study, with the exception of quarterly growth monitoring.

EPA will submit a letter of completion in compliance with paragraph 15 of the Consent Decree which will cover all sections of part (7), **Engineering Studies**, after the Five-Year Review is completed.

8. Establishment of Alternate Concentration Limits - The original date of completion for this remedial action, as stated in the Consent Decree, is one year from the date the CD is entered into the court system. It has now been over six years since that date and the ACL Demonstration is nearing completion. The reason for such a lengthy process is that at the time the CD was written, the Settling Party did not know to what extent this document would have to be written. Hindsight reveals that a one year's time allotment for such a project was not reasonable. The main obstacle that was blocking the ACL was the approval of the Hydrogeologic Investigation. Since this will be an integral component in determining proper attenuation factors for the ACL, the Investigation must be complete before it can be used in the ACL.

Along with the Hydrogeologic Investigation, other scientific investigations and assessments have been conducted in this period. These include biological field investigations, health and ecological assessments, and health and ecotoxicity-based Protective Concentration Limit (PCL) reports. All of the above will play a role in determining the most reasonable ACLs.

The ACLs will be evaluated as to their protectiveness as groundwater protection standards on a 5-year basis during the Five Year Reviews. Because ACLs allow for contamination in groundwater to remain above levels that would allow groundwater to be used as drinking water and because waste will remain at the site above levels that allow for unlimited use and unrestricted exposure to the Site, future Five Year Reviews of the ACLs at the Winthrop Site will involve two major steps:

- a. Risk Assessment using groundwater and surface water compliance monitoring information regarding the previous five years to determine that the risk to human health and the environment remains within the acceptable risk ranges.
- b. Evaluate groundwater and surface water analytical results collected during compliance monitoring to determine whether or not there is:
 - i. a statistically significant increase of contaminant concentrations,
 - ii. a change in exposure pathway, or
 - iii. an exceedance of groundwater protection standards (ACLs, PCLs).

The Five Year Review will determine whether or not the ACLs remain groundwater protection standards which are protective of human health and the environment. As a result of the above mentioned reviews EPA will determine if any additional actions are necessary to maintain the protectiveness of the Site.

9. Installation and Operation of a Groundwater Interceptor System - To date, the EPA has conditionally approved the 60% design of the interceptor system. This System depends a lot on the Hydrogeological Investigation, and had to wait for its completion before the design could be started. The design report includes information on the number of extraction wells needed, their location, the pumping rates, capture zones, well construction, quality assurance/ quality control (QA/QC), operation and maintenance (O& M), and a schedule.

The triggers for this System are the IPS and the future ACLs. If the IPS or ACLs are ever exceeded and confirmed then the Groundwater Interceptor System must be built and put to work within the time it takes for a plume to travel from the Point of Compliance to the extraction wells. Since the expected implementation time for this System does not exceed the time it takes for the plume to reach the planned locations of the extraction wells, it appears that the System will be effective. The proposed Interceptor System will be able to capture the contaminants that were detected when the concentration limits were exceeded in the first place, assuring that the high concentrations will be extracted and treated before the contaminants can migrate further to Hoyt Brook or Annabessacook Lake.

10. Installation and Operation of a Groundwater Treatment System - This system is being designed in conjunction with the Groundwater Extraction System. Since the two were submitted together, the Treatment System is also at the 60% design stage.

IV. SITE VISIT

A Site visit was performed on June 4, 1992 by EPA and MEDEP personnel. This visit serves as part of the Landfill Cap remedial action completion report. The chain link fence was found to be in good repair and functioning to restrict access and the Landfill Cap did not exhibit any severe disfunction. The Landfill growth appeared to be growing thick and only a few repairs to the fences, chain link and siltation, were needed. Only two places on the Landfill were not satisfactory. Both lacked vegetation growth and one of them had a red staining.

IV. PROTECTIVENESS

The Winthrop Landfill Site continues to be protective of direct exposure to Landfill contaminants. The Landfill Fence is in good repair and will remain in place to protect from accidental exposure to contaminants. There is no threat of hazardous gaseous emissions from the Landfill since the Cap contains a gas control layer inhibiting gas emission. As for drinking water, the Town's Ground Water Ordinance inhibits any use of wells in the Landfill area and the surrounding residences have been attached to the Town's water line.

There are approximately 21 homes in close proximity to the Landfill. Most of these homes obtained their drinking water from individual residential wells prior to 1984. In recent years the land south of the Landfill was developed into a mobile home park whose sites are predominantly occupied. A six lot subdivision has been approved in the vicinity of Hoyt Brook, just beyond the perimeter of the Ground Water Ordinance. None of the residences are utilizing groundwater from within the Ordinance area, but concern exists if wells are drilled in the six lots near Hoyt Brook. The northern plume will be monitored carefully to ensure that contamination cannot reach these wells.

Currently, contaminated groundwater is entering the following surface water bodies via seeps: 11.5 acre Sphagnum Bog to the east of the Site, 6 acre Cattail Marsh to the north of the Site, Hoyt Brook, Shoreline Wetland, and 1,420 acre Annabessacook Lake. The Lake is in the upper reaches of the Cobbossee Watershed and connects to Cobbosseecontee Lake. The lower reaches of the Watershed provide backup municipal water supplies for Augusta, Maine.

There is concern that a day care center, located on the northern side of Hoyt Brook, is using water upstream from the documented seeps. Water pumped from the Brook is used to water the grass and as a drinking water supply for horses.

The proposed groundwater Extraction and Treatment System will draw back the contaminated groundwater and treat it. This will prevent contaminated groundwater from leaving the Site. This drawing back of the groundwater should arrest seepage into the surface water bodies. On August 13, 1992 the Settling Party agreed to complete the 90% design and construct the proposed groundwater Extraction and Treatment System.

VI. CONCLUSIONS

At present all of the Remedial Actions have satisfied the Consent Decree Remedial Action Work Plan. Regarding the landfill cap one deviation from the approved remedial action workplan was slope failure on the eastern portion of the landfill. This problem has been corrected so that an equivalent performance standard of cap

permeability can be attained.

In a letter dated August 25, 1992, the Settling Party acknowledged that the ACLs being formulated will be exceeded by the Landfill contaminants. Further, the Settling Party has agreed that the Groundwater Extraction and Treatment Systems will be built. The only outstanding component to the design phase of the Systems is the setting of the ACLs. EPA and MEDEP will establish the ACLs in the near future.

Since the Site does not allow for unlimited use and unrestricted exposure, EPA will conduct another Five Year Review in 1997. These reviews will continue until such criteria are met. The next Five Year Review, will again assert the protectiveness of the Fence and Cap, plus the Groundwater Extraction and Treatment Systems.

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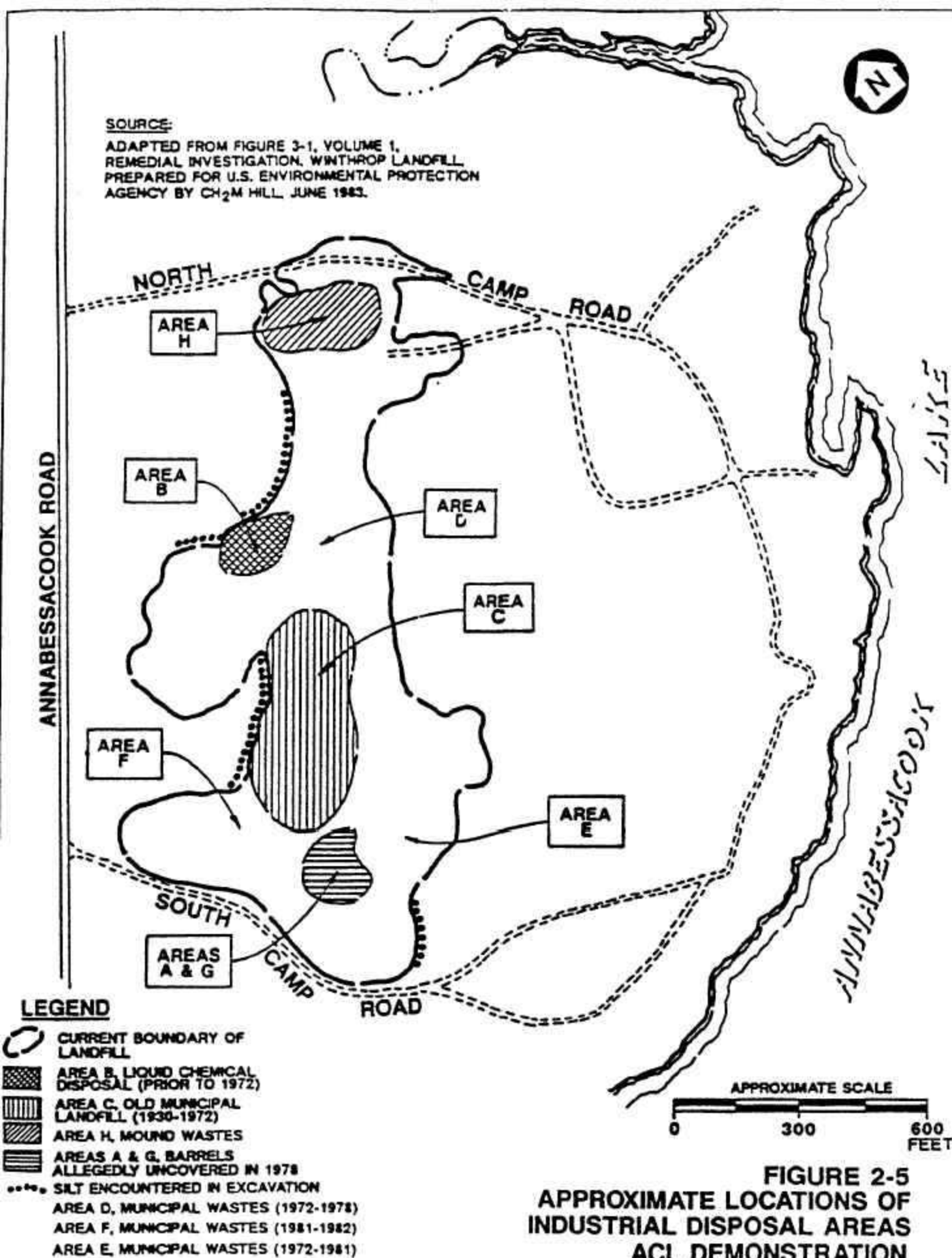
ATTACHMENT III

TABLE 1 QUARTERLY ANALYTICAL PROTOCOL

2,4- dinitrophenol
diethyl phthalate
chrysene
benzene
1,1- dichloroethane
1,2- dichloroethane
1,1,1- trichloroethane
chloroethane
1,1- dichloroethylene
1,2- dichloropropane
1,2- trans- dichloroethene
ethylbenzene
methylene chloride
fluorotrichloromethane
tetrachloroethylene
toluene
trichloroethylene
vinyl chloride
acetone
methyl ethyl ketone
methyl isobutyl ketone
methyl butyl ketone
styrene
xylenes
tetrahydrofuran
di- 2- ethylhexyladipate
dimethylformamide
2- methoxyethanol (methyl cellosolve)
phenol
nickel
arsenic
zinc

SOURCE:

ADAPTED FROM FIGURE 3-1, VOLUME 1,
REMEDIAL INVESTIGATION, WINTHROP LANDFILL,
PREPARED FOR U.S. ENVIRONMENTAL PROTECTION
AGENCY BY CH₂M HILL, JUNE 1983.



ATTACHMENT IV**TABLE 2 ANNUAL ANALYTICAL PROTOCOL THE 129 PRIORITY POLLUTANTS**Volatile Organic Compounds

acrolein
acrylonitrile
carbon tetrachloride
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
2-chloroethyl vinyl ether
chloroform
1,3-dichloropropene
bromoform
dichlorobromomethane
dichlorodifluoromethane
chlorodibromomethane
bis (chloromethyl) ether

Base- Neutral Extractable Organic Compounds

| | |
|-------------------------------|------------------------------|
| acenaphthene | nitrobenzene |
| benzidine | n- nitrosodimethylamine |
| 1,2,4-trichlorobenzene | n- nitrosodiphenylamine |
| hexachlorobenzene | n- nitrosodi- n- propylamine |
| hexachloroethane | butyl benzyl phthalate |
| bis (2-chloroethyl) ether | di-n-butyl phthalate |
| 2-chloronaphthalene | di-n-octyl phthalate |
| 1,2-dichlorobenzene | diethyl phthalate |
| 1,3-dichlorobenzene | dimethyl phthalate |
| 1,4-dichlorobenzene | benzo (a) anthracene |
| 3,3-dichlorobenzidine | benzo (a) pyrene |
| 2,4-dinitrotoluene | benzo (b) fluoranthene |
| 2,6-dinitrotoluene | benzo (k) fluoranthene |
| 1,2-diphenylhydrazine | acenaphthylene |
| fluoranthene | anthracene |
| 4-chlorophenyl phenyl ether | benzo (g,h,i) perylene |
| 4-bromophenyl phenyl ether | fluorene |
| bis (2-chloroisopropyl) ether | phenanthrene |
| bis (2-chloroethoxy) methane | dibenzo (a,h) anthracene |
| hexachlorobutadiene | ideno (1,2,3,- cd) pyrene |
| hexachlorocyclopentadiene | pyrene |
| isophorone | bis (s-ethylhexyl) phthalate |
| naphthalene | |

Acid Extractable Organic Compounds

| | |
|-----------------------|----------------------|
| 2,4,6-trichlorophenol | 4,6-dinitro-o-cresol |
| d-chloro-m-cresol | 2,4-dichlorophenol |
| 2-chlorophenol | pentachlorophenol |
| 2-nitrophenol | 2,4-dimethylphenol |
| 4-nitrophenol | |

Pesticides and PCBs

| | |
|--------------------|--|
| aldrin | alpha-BHA |
| dieldrin | beta-BHC |
| 4,4'-DDE | PCB-1242 |
| 4,4'-DDD | PCB-1254 |
| alpha-endosulfan | PCB-1221 |
| beta-endosulfan | PCB-1232 |
| endosulfan sulfate | PCB-1248 |
| endrin | PCB-1260 |
| endrin aldehyde | PCB-1016 |
| heptachlor | toxaphene |
| heptachlor epoxide | 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) |

ATTACHMENT IV (cont.)

Metals

| | |
|-----------------|---------------|
| antimony (Sb) | mercury (Hg) |
| beryllium, (BE) | selenium (Se) |
| cadmium (Cd) | silver (Ag) |
| chromium (Cr) | thallium (Tl) |
| copper (Cu) | |
| lead (Pb) | |

Miscellaneous

total cyanides

**ANNUAL ANALYTICAL PROTOCOL
ANALYSES IN ADDITION TO THE PRIORITY POLLUTANTS**

Inorganic Constituents

calcium
iron
magnesium
potassium
sodium
chloride
sulfate

Volatile Organic compounds

1,2- cis-dichloroethylene

Non-Volatile Organic Compounds

di-2-ethyladipate
di-2-ethylhexyladipate

ATTACHMENT 5

TABLE 6

POTENTIALLY APPLICABLE CRITERIA FOR CHEMICALS
FOUND AT WINTHROP LANDFILL SITE

Concentrations in Fg/l

| Chemical | Ambient Water Quality Criteria ^a | | | | | ADI ⁱ |
|-------------------------------|---|----------------------|---|--------------------------|----------------------|------------------|
| | Aquatic Life(Freshwater) ^b | | Human Consumption of Fish ^c | | | |
| | Acute ^c | Chronic ^d | 10 ⁻⁵ Cancer Risk ^e | Conc.Limits ² | | |
| <u>Phenols and Alcohols</u> | | 150cc | | | | |
| 2,4-dinitrophenol | 230 ^{cc} | | | | 14,300 | 140 |
| 2-methoxy ehtanol | | | | | | |
| phenol | 10,200 | 2,560 | | | | 7,000 |
| <u>Aromatics</u> | | | | | | |
| benzene | 5,300 | | 400 ^h | | | |
| ethylbenzene | 32,000 | | | | 3,280 | 1,600 |
| styrene | | | | | | |
| toluene | 17,500 | | | | 424,000 | 30,000 |
| xylene | | | | | | |
| <u>Chlorinated Aliphatics</u> | | | | | | |
| <u>Methanes</u> | 11,000 ^h | | 157 ^h | | | |
| methylene chloride | | | | | | 13,000 |
| fluorotrichloromethane | | | | | | 96,000 |
| <u>Ethanes</u> | | | | | | |
| chloroethane | | | | | | |
| 1,1-dichloroethane | | | | | | |
| 1,2-dichloroethane | 118,000 | 20,000 | 2430 | | | 520 |
| 1,1,1-trichloroethane | 18,000 | | | | 1.03x10 ⁶ | 38,000 |
| <u>Propane</u> | | | | | | |
| 1,2-dichloropropane | 23,000 | 5,700 | | | | |
| <u>Ethylenes</u> | | | | | | |
| vinyl chloride | | | 5250 | | | |
| 1,1-dichloroethylene | 11,600 | | 18.5 | | | |
| 1,2-dichloroethylene | 11,600 | | | | | |
| trichloroethylene | 45,000 | | 310 | | | 1,700 |
| tetrachloroethylene | 5,280 | 840 | 88.5 | | | |
| <u>Ketones</u> | | | | | | |
| acetone | | | | | | |
| methyl butyl ketone | | | | | | |
| methyl ethyl ketone | | | | | | |
| methyl isobutyl ketone | | | | | | |
| <u>Others</u> | | | | | | |
| chrysene | | | .311 ^x | | | |
| di-2-ethylhexyl adipate | | | | | | |
| diethylphthlate | 940 ^z | 3 ^z | | | 1.8x10 ⁶ | 880,000 |
| dimethyl formamide | | | | | | |
| tetrahydrofuran | | | | | | |

ATTACHMENT 5 (cont.)

TABLE 7

**POTENTIALLY APPLICABLE CRITERIA FOR CHEMICALS
FOUND AT WINTHROP LANDFILL SITE**

Concentrations in Fg/l

| Chemical | Ambient Water Quality Criteria ^a | | | | |
|-------------------------------|---|---------------------------------|---|---------------------------|------------------|
| | Aquatic Life(Freshwater) ^b | | Human Consumption of Fish ^c | | |
| | Acute ^c | Chronic ^d | 10 ⁻⁵ Cancer Risk ^f | Cone. Limits ^g | ADI ⁱ |
| <u>Phenols and Alcohols</u> | | | | 14,300 | |
| 2,4-dinitrophenol | 230 ^{cc} | 150 ^{cc} | | | 140 |
| 2-methoxy ethanol | [10 ⁶] ¹ | [10 ⁵] ¹ | | [14,300] ^a | |
| phenol | 10,200 | 2,560 | | [142,000] ^e | 7,000 |
| <u>Aromatics</u> | | | | | |
| benzene | 5,300 | [530] ^m | 400 | | |
| ethylbenzene | 32,000 | [3,200] ^m | | 3,280 | 1,600 |
| styrene | [25,000] ¹ | [2,510] ^m | | [3,280] ^t | |
| toluene | 17,500 | [1,750] ^m | | 44,000 | 30,000 |
| xylene | [1,300] ¹ | [130] ^m | | [3,280] ^t | |
| <u>Chlorinated Aliphatics</u> | | | | | |
| <u>Methanes</u> | 11,000 ^h | [1,100] ^m | 157 ^h | | |
| methylene chloride | [11,000] ^h | [1,100] ^{h,m} | | [228,000] ^e | 13,000 |
| fluorotrichloromethane | [11,000] ^h | [1,100] ^{h,m} | | | 96,000 |
| <u>Ethanes</u> | | | | | |
| chloroethane | [1.18x10 ⁶] ^p | [200,000] ^p | | [163,000] ^u | |
| 1,1-dichloroethane | [118,000] ^p | [20,000] ^p | | [163,000] ^v | |
| 1,2-dichloroethane | 118,000 | 20,000 | 2430 | | 520 |
| 1,1,1-trichloroethane | 18,000 | [3,000] ⁿ | | 1.03x10 ⁶ | 38,000 |
| <u>Propane</u> | | | | | |
| 1,2-dichloropropane | 23,000 | 5,700 | | [163,000] ^u | |
| <u>Ethylenes</u> | | | | | |
| vinyl chloride | [11,600] ¹ | [1,650] ^o | 5250 | | |
| 1,1-dichloroethylene | 11,600 | [1,650] ^o | 18.5 | | |
| 1,2-dichloroethylene | 11,600 | [1,650] ^o | | [88,100] ^{k,v} | |
| trichloroethylene | 45,000 | [6,430] ^o | 310 | | 1,700 |
| tetrachloroethylene | 5,280 | 840 | 88.5 | | |
| <u>Ketones</u> | | | | | |
| acetone | [5x10 ⁶] ^j | [500,000] ^m | | [117,000] ^w | |
| methyl butyl ketone | [46,000] ^{dd} | [4,600] ^m | | [117,000] ^w | |
| methyl ethyl ketone | [5x10 ⁶] ^j | [500,000] ^m | | [117,000] ^w | |
| methyl isobutyl ketone | [46,000] ^j | [4,600] ^m | | [117,000] ^v | |
| <u>Others</u> | | | | | |
| chrysene | [1,700] ^z | [520] ^z | .311 ^x | | |
| di-2-ethylhexyl adipate | [2,550] ^q | [250] ^q | | [.661] ^y | |
| diethylphthlate | 940 ^y | 3 ^y | | 1.8x10 ⁶ | 880,000 |
| dimethyl formamide | [10,200] ^{aa} | [1,020] ^m | | [19,500] ^y | |
| tetrahydrofuran | [225,000] ^{bb} | [22,500] ^m | | [54,000] ^y | |

[] indicates surrogate or computed criterion. See next page for other footnotes.

ATTACHMENT 5 (cont.)

NOTES FOR TABLES 6 & 7:

- a Ambient Water Quality Criteria were formulated to protect aquatic life and human health from pollutants in surface waters (40 CFR Summary, FR Nov. 23, 1980, p. 79318-79379 and FR Feb. 7, 1984, p. 4551-4554). Ambient Water Quality Criteria are not enforceable but are useful in establishing water quality-based effluent limitations, water quality standards, and toxic pollutant effluent standards, and in assessing potential environmental effects.
- b Guidance criteria for the protection of fresh water aquatic life. Concentrations specified should protect most (but not necessarily all) aquatic freshwater life and its uses.
- c The acute toxicity level is the maximum value to which organisms can be exposed without significant risk of adverse impact.
- d Chronic toxicity level is the 24-hour average value that organisms can be exposed to without significant risk of adverse impact. Weekly (7.5-day) and monthly (27-day) values were established when insufficient data were available to develop a 24-hour lifetime average value. Monthly and weekly values are set at levels where organisms can be exposed over that time period with no significant risk of adverse effect.
- e Human Health Guidelines have been developed by the Office of Research and Development. UCRs (Unit Cancer Risks) for carcinogens, and concentration limits (no effect or specific risk concentrations) have been established to protect a 70- kg adult against average daily consumption of contaminated drinking water and/ or fish. The average daily consumption is 2R/day of drinking water and 6.5 gram/ day of fish (freshwater, estuarine and shellfish products).
- f Unit Cancer Risks (UCRs) have been established assuming lifetime exposure and 10^{-5} , 10^{-6} , and 10^{-7} risk levels. 10^{-5} is used in the USEPA Guidance Document for Feasibility Studies under RCRA (October 18, 1984) and has been presented in this table.
- g Concentration limits are set at levels above which health would be affected through ingestion of contaminated drinking water and/ or aquatic organisms.
- h Criterion for total balomethanes.
- i ADI (Acceptable Daily Intake) is defined as the maximum daily dosage of a substance that a human (average weight-70 kg.) can be exposed to without lifetime risk. They are based on chronic toxicity data without consideration of potential carcinogenic risk.
- j Based on LD50 for goldfish.
- k Based on 1,2- trans- dichloroethylene.
- l Based on a literature search conducted by Envirologic Data to identify the lowest LC50 level (lethal concentration levels for 50 percent of the test organisms) .
- m Based on a safety factor of 10 to prevent effects from chronic exposure versus acute exposure recommended by Envirologic Data.
- n Based on a safety factor of 6 to prevent effects from chronic exposure versus acute exposure for chlorinated ethanes, based on the ratio between acute and chronic criteria for 1,2 dichloroethane, another chlorinated ethane.
- o Based on a safety factor of 7 to prevent effects from chronic exposure versus acute exposure for the ratio between acute and chronic criteria generated by EPA for tetrachloroethylene, another chlorinated ethylene.
- p Based on the criterion for 1,2-dichloroethane which is more or as chlorinated and, therefore, likely to be at least as toxic.
- q Derived by extrapolation of rat LD50 (lethal dose for 50 percent of test rats) data for di-2-ethylhexyl adipate) to fish based on rat-to-fish body weight ratio, adsorption coefficient, and ventilation volume of fish.

ATTACHMENT 5 (cont.)

NOTES: (cont.)

r Based an acceptable daily intake as promulgated by EPA. Criteria were generated based an the ADI, bioconcentration factor (BCF) , and average daily intake of fish as follows:

$$\frac{\text{ADI (F q/ R)}}{\text{BCF(R / kg) x 0.0065 kg}} = \text{Criterion.}$$

The BCF was determined from the chemical' s solubility or partition coefficient (Kow) .

s Based on the criterion for 2,4-dinitrophenol.

t Based on the most stringent criterion for non- carcinogenic aromatics (ethylbentene).

u Based on the most stringent criterion for non- carcinogenic chlorinated ethane (1,1-dichloroethane).

v Based an lowest effect levels compiled by Envirologic Data from preliminary literature search. ADI was generated based on 70- kg human and 10,000 safety factor. See footnote " r" for computation of criterion.

w Based on the criterion for methyl isobutyl ketone.

x Based an the UCR for polynuclear aromatic hydrocarbons.

y Criterion fox total phthalate esters.

z Based on lowest values for available freshwater aquatic life criteria for polyaromatic hydrocarbons (aceenphthalene). Acute value for bluefish; chronic value for algae.

aa Based an TLM data for rainbow trout exposed to dimethyl formamide.

bb Concentration of tetrahydrofuran reported to cause inhibition of cell multiplication in algae.

cc Criterion for total nitrophenols.

dd Based an criteria for methyl isobutyl ketone, due to similar chemical structure.